

Chapter 3: Research methods

The research process

A theory is a tentative explanation for phenomena and attempts to describe how ideas fit together. In order to investigate a theory, a researcher must formulate a hypothesis, that is a tentative, testable assumption or prediction as to how the independent variable(s) or treatment(s) will affect the dependent variable(s).

A variable is a factor that has the capacity to increase or decrease in amount or kind. Characteristics that are fixed or unchanging factors cannot be considered as variables in an experiment.

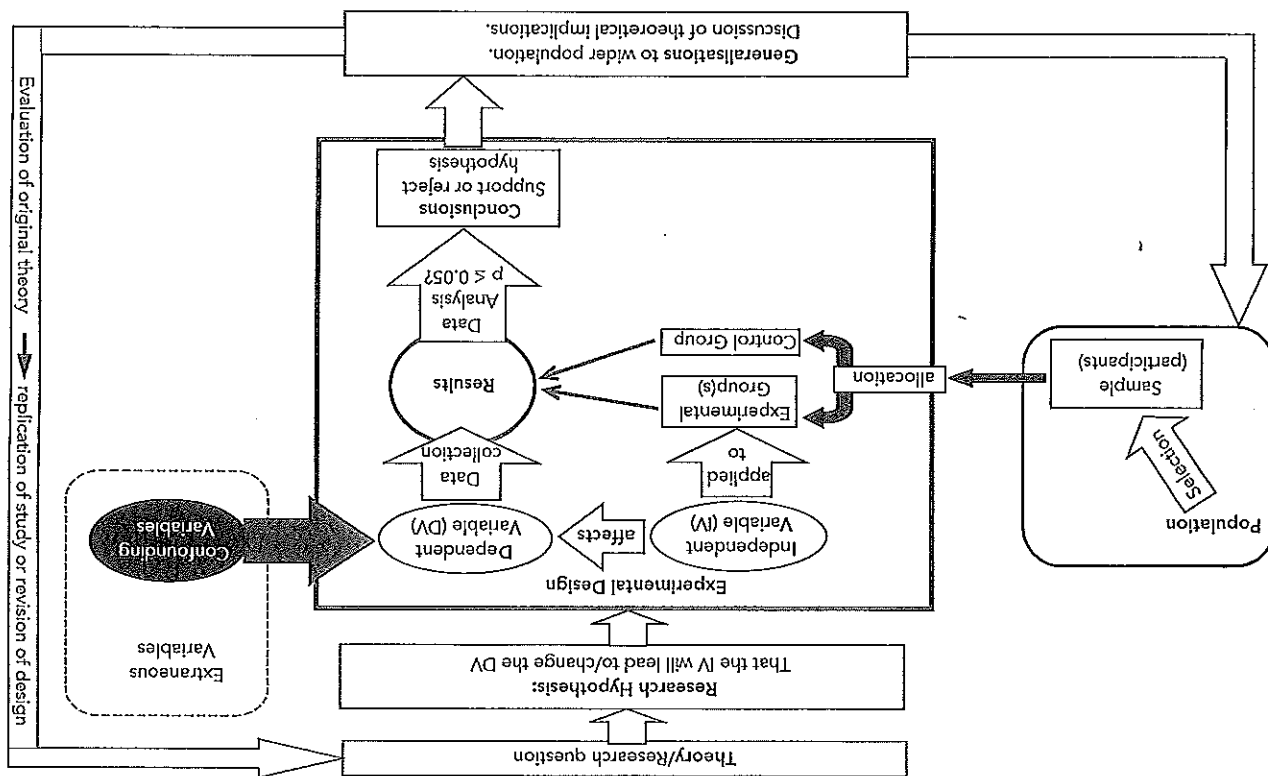
An independent variable (IV) refers to the treatment variable in an experiment that has been deliberately varied or systematically manipulated by the experimenter in order to measure whether it produced a change in the dependent variable, measured by a change in the participant's behaviour or performance. Therefore, a dependent variable (DV) is

an element of a participant's behaviour or experience that can be observed or measured as being altered in some way as a result of changes in the independent variable. This measure is obtained to test the outcome of the experiment. If a theory or hypothesis proposes a cause-effect relationship, then the independent variable is perceived as the cause. Changes in the dependent variable are therefore perceived as being an effect of the manipulation of the independent variable.

Operational hypotheses

As many of the variables in psychological research are abstract concepts, the researcher must design their experiment so that they can be measured through observable behaviours.

An operational hypothesis expresses the experimental/research hypothesis in terms of how the researcher will determine the presence and levels of the variables under investigation; that is, how the experimenter is going to put their hypothesis into operation.



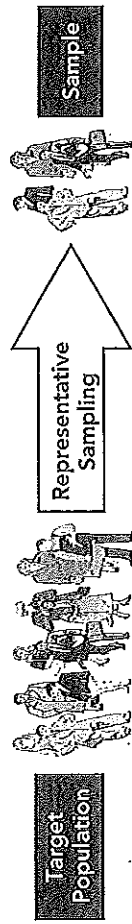
The operational hypothesis would describe how variables will be observed, manipulated and measured by the experimenter along with details of the population sampled.



When asked to write an operational hypothesis within a short-answer question, remember **IPOD** – as your statement should include the Independent variable, identification of the **Participants/Population** of interest, how the variables will be **Operationalised** (put into practice within the research design) and the **Dependent variable**.

Participant selection

The process of selecting participants for a study from the population of interest is known as sampling. In order to generalise the results back to the population, samples should be as representative (or typical) of the population as possible and should include sufficient participants to portray the variety of individuals within the total group from which it is drawn.



Convenience sampling is the process of selecting participants who are easily obtainable, for example newspaper polls, radio station phone-ins or approaching individuals in a shopping centre. Such a sample may not be representative of the population and may be biased as individuals actively volunteer to participate in the study or are drawn from a narrow stratum of the population.

Random sampling allocates participants from the population of interest to form part of the sample such that each member of the population has an equal chance of being selected. If the sample is of sufficient size, it is usually representative of the population.

Stratified sampling attempts to prevent biases by making the sample more representative of the population. This involves identifying some of the relevant factors (strata) present in the population, such as age, sex, or income level, and then selecting a separate sample from each stratum in the same proportions as the population.

Stratified sampling can be very time-consuming, as the relevant characteristics and/or factors need to be identified and their proportions in the target population calculated.

Participant allocation

While random sampling is a method used to *select* participants for an experiment, random assignment is a means of *experimental control* which is used to place participants into groups. Random assignment ensures that the participants selected for the experiment are equally likely to be placed in any of the groups in an experiment. Doing so will obtain similar groups before the independent variable is administered so that its effect can be accurately measured.

In an experimental group, the participants are exposed to the independent variable in order to observe its effects on their behaviour or experience.

Most experiments also incorporate a control group, which is a group of participants within an experiment that should be similar in characteristics to the experimental group, but which has not received the independent variable. The control group is used as a standard for comparison against the experimental group that has received the independent variable. This enables the researcher to determine or conclude whether it was the independent variable that has affected the dependent variable.

Ways to minimise the effects of extraneous variables

Extraneous variables are those elements outside of the experimental design that have the potential to influence the dependent variable and so could have an unwanted or unintentional effect on the results of the study. Such variables may be associated with characteristics of the participants, the researcher or the experimental design itself. As such, extraneous variables are conditions a researcher wants to prevent from influencing the outcome of the experiment.

The two types of extraneous variables are controlled and uncontrolled variables.

Controlled variables are those extraneous variables whose influence has been removed (or at least diminished) from the research via sampling, procedure or by the use of statistical methods of control.

Uncontrolled variables are variables that have influenced the result because their presence was not accounted for (and removed) in the experimental method.

Uncontrolled variables that cause a systematic variation (change) in the value of the dependent variable are termed 'confounding variables'.

A confounding variable is, therefore, any unwanted factor occurring in the procedures, experimenters or participants in an experiment that can intervene with the cause-effect relationship between the independent variable and the dependent variable.

Experiments can demonstrate that the IV influences the DV and, if the research is carefully designed, we can generalise the results of laboratory experiments to phenomena in everyday life. However, as there may be flaws in the research design, the study should be repeated a number of times to clearly display a causal relationship between the IV and DV before conclusions can be applied to the general population.

Placebo effect

A placebo is a fake treatment, often used in medical research in the form of sugar tablets or injections, that is used as a control

condition in experiments to counter the effect of participants knowing they have taken something.

In psychological research, the placebo effect may occur when a participant's response (the dependent variable) is influenced not by a specific procedure which has been administered to elicit that behaviour (the independent variable), but rather by the expectancy of how they should behave. A placebo is therefore used as a controlled variable to limit the difference between certain expectations being experienced by members of the experimental group that are not experienced by the control group.

To control the potentially confounding influence of the placebo effect, a researcher could employ a single-blind procedure, whereby the researcher allocates participants to groups such that they are unaware of the experimental or control condition to which they have been assigned, thereby reducing the chances of participants guessing the aims of the study. Experimenter bias, however, can still be present.

Experimenter effect

An experimenter effect occurs when the unconscious expectations, personal characteristics or treatment of the data by the experimenter may adversely affect the dependent variable which may bias the experimental results. This can occur if the experimental and control groups are treated differently in ways other than those related to the independent variable.

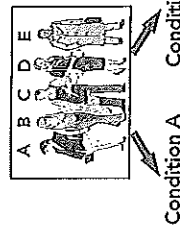
Experimenter bias also occurs when the researcher's unconscious expectations or motivation may influence, and therefore distort, their observations of data. To eliminate this, experimenters could use a double-blind procedure in which neither the experimenter nor the participants are aware of which subjects have been allocated to the experimental or control group. A third person controls the placement of groups.

A brief overview of three experimental designs

Repeated-measures design

In the repeated-measures design, one group of participants undertakes both experimental conditions, (i.e. the experimental and the control condition).

Repeated measures



The advantage of this is that subject variables are highly controlled as they are kept constant between conditions. For example, the intelligence levels and personality traits are identical in both groups as the same people are used. Another advantage is that fewer participants are required, as each is used more than once, making the research more economical.

The disadvantage of this is that repetition effects can occur. The participants may be bored and/or fatigued when performing the second condition as they have already performed a task.

A further disadvantage of this method is that the practice effect could make the results invalid. For example, if students were taught touch typing using two different methods, their performance using the second method may be superior due to practice using the first method. In situations such as the one described, the repeated-measures design is inappropriate.

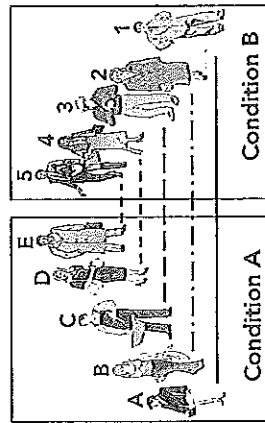
The disadvantages of the effects of repetition may be overcome by counterbalancing the groups by placing half the participants in the experimental condition

first and the other half in the control condition first, thereby balancing the order effects equally between both conditions.

Matched-participants design

The matched-participants design (or matched-pairs design) involves placing equivalent pairs of participants into each group. Participants in each condition are paired according to any important variables which, if not controlled, may have a confounding effect on their performance in the research. These include intelligence, experience, age and sex.

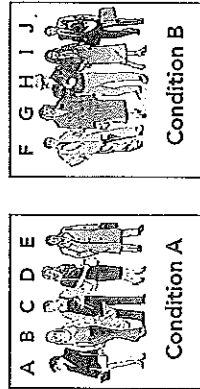
Matched pairs



The matched-participants design eliminates order effects and demand characteristics (such as fatigue) as the participants only participate in one experimental condition. Although this design attempts to keep subject variables constant between conditions, participants can never be perfectly matched in every respect. The process of matching participants is also very time consuming and can be difficult to achieve.

Independent-groups design

The independent-groups design uses random allocation to groups as a means of controlling confounding variables. Random allocation (also termed random assignment) ensures that participants selected for the experiment are equally likely to be placed in any of the experimental or control groups.



The independent-groups design also eliminates order effects and demand characteristics as the participants only participate in one experimental condition, but subject variables could still occur despite random assignment. This design is therefore the least effective method of research design in minimising the effects of extraneous variables and is only used when it is impossible to use the matched-participants design.

Statistics

Quantitative measures should take the form of numerical values, and are able to be expressed in units of measurement, e.g. a test score or physiological measurements, such as height and weight.

Qualitative measures are factual

descriptions about the characteristics of the subjects' behaviour. Qualitative data should be in the form of words. For example, case studies or responses to open-ended questions.

Subjective data is obtained by self-report measures in which subjects give verbal or written responses to a series of research questions, e.g. a survey on attitudes or the description of a dream.

Objective data is data that has been gathered using systematic observation which is not influenced by any personal bias, e.g. brain images or a test score.

Descriptive statistics help to organise data in order to provide a summary which can be easily interpreted or communicated.

Descriptive statistics provide information to the researcher about their research sample which may affect their choice of inferential statistics.

Measures of central tendency: the mean, median and mode

Measures of central tendency are statistics that indicate information about the middle scores in a set of data. These middle scores

are used as indicative measures for trends in the population. Measures of central tendency include the mean, median and mode.

The mean is the average score, which is obtained by adding up all of the scores in the set of data and dividing this sum by the total number of scores present.

The mean is the most sensitive measure of central tendency; however, it can be distorted by extreme or 'freak' values.

The median is the middle point in a set of data.

The mode is the most frequently

occurring score in a set of data. Some

distributions may have more than one mode.

Measures of dispersion

The range indicates the dispersion, or difference between the highest and lowest scores in a set of data. Although quick and easy to calculate, it can be distorted by extreme or 'freak' values.

The standard deviation is a measure

of the variability of scores in a distribution indicating the average difference between the scores and their mean. The standard deviation is the most sensitive measure of dispersion, as it uses all the data available. The size of the standard deviation gives us an indication of the shape of the curve (a large standard deviation yields a flatter curve; small standard deviations mean a higher curve).

Inferential statistics

Inferential statistics are formal data analyses that measure the likelihood of results obtained for a study occurring by chance.

Inferential statistics allow us to deduce whether the effect observed within the results obtained from a sample of subjects is probably typical of the target population from which the sample was derived.

Measures of statistical significance

indicate whether the results obtained in an experiment do not occur by chance and may therefore be attributed to other variables.

Significant = important, noteworthy
If results are significant, then they are important in terms of supporting the hypothesis.

Interpretation of p values

The p value represents the probability level which forms the basis for deciding whether chance factors are responsible for the results obtained.

A significant result is one where there is a low probability that chance factors were responsible for any observed difference, correlation or association in the variables tested.

A 0.05 significance level occurs when the probability of chance is five or fewer times in 100 repetitions of the research. In general, psychologists accept a level of $p \leq 0.05$ as being statistically significant in order to conclude that results are due to the influence of the independent variable and not to chance. Stricter probability values (p) of significance are sometimes employed, such as $p < 0.01$ (less than 1 in 100) and $p < 0.001$ (less than 1 in 1000).

To remember the acceptable limit/cut-off for results to be significant, think of the drink-driving law for non-probationary drivers. If they are under 0.05 then it is acceptable, but if they are over 0.05 there is a problem.

Appropriateness of conclusions and generalisations based on results obtained

In psychological research, when an individual draws a conclusion based on the results obtained, they draw an inference as to whether the hypothesis has been supported or rejected. In making this decision, researchers have to ensure that any change in the dependent variable was solely due to the impact of the independent variable, rather than any confounding uncontrolled variables that have not been accounted for and removed in the experimental method.

A conclusion applies only to the sample used in the research. If a researcher generalises their results beyond the research, they are stating that their research findings

may be applied more widely from the sample tested to the population of interest. A generalisation is an application of the conclusions based on the results obtained to a wider population in other similar settings outside the study. When generalising, researchers need to ensure that any uncontrolled variables have been accounted for and that the relationship between the independent and dependent variable in the results obtained is statistically significant.

An overview of ethical considerations in the conduct of psychological research

Ethics are moral principles and standards for practice that are applied by psychologists in order to maintain an appropriate level of care for their clients and/or participants in psychological research. These principles have been formalised into a code of ethics which provides guidelines that psychologists must follow when dealing with humans and/or animals.

The aim of psychology is to provide a greater understanding of behaviour, especially in humans and, in some cases, to enable the use of that understanding to predict and control behaviour to improve the human condition.

To achieve this, psychologists often have no other choice but to use human participants in order to obtain valid results. In so doing, the researcher must take into account additional mental factors (e.g. emotional reactions, embarrassment, guilt, loss of self-esteem) on top of physical constraints (e.g. pain, stress, anxiety) that are present in research with animals. As humans also have rights of protection and privacy, psychologists must resolve a variety of ethical dilemmas:

- Do the 'ends' (knowledge/understanding) justify the 'means' (research design)?
- How far should psychologists be allowed to go in pursuing their knowledge, especially of extreme or undesirable behaviours?

- Will the knowledge gained serve a useful purpose for the betterment of all humankind?

Role of the experimenter

In planning research, psychologists must first carefully evaluate the ethical issues involved, including the need to balance the welfare of those who may eventually benefit from the findings of the study against any risk or discomfort for the participants. As such, all psychological research should conform to the overriding ethical principle of beneficence, whereby the researcher is responsible for maximising potential benefits of the research and minimising the potential risks of harm or discomfort for all research participants. The ethical principle of justice should also be applied to promote a fair distribution of benefits and inconvenience within the population of interest, as well as for any individual research participant.

A researcher should also demonstrate the principle of respect for persons by having a proper regard for the welfare, rights, beliefs, perceptions, customs and cultural heritage of all individuals involved in their research.

When working in a multidisciplinary research team, psychologists must make their ethical concerns known to other members and work towards resolving any problems before the commencement of the study.

The experimenter must take all reasonable steps within the experimental design to prevent any injury or distress to the participants. If the study needs to create physical or mental stress in the participants as a part of the design, then the researcher must get the informed consent of the participants. In this process, each participant is given all the necessary details about the procedures to be used, including any potential risks, and the probable effects to be expected in order to reach a decision about whether to participate in the experiment.

Under certain circumstances, it may be necessary for the researcher to use deception to hide the research aims from participants in order to prevent them from behaving differently (e.g. trying to either please the researcher or spoil the results). Many studies would not achieve valid

results if deception was not used, and so the researcher must balance the gains against the effect on the participants and ensure that they do not suffer distress as a result of the research procedure.

For studies where the disclosure of the purpose is withheld for scientific reasons, it is essential that debriefing of participants occurs in order to alleviate any distress or remove any misconceptions caused by deception within the experimental design. After the experiment, feedback is given to the participants about the aims and results or interpretations of the study of which they were a part. The aim is to ensure that participants leave the experiment in as similar a state as possible to how they entered it, ensuring that no participant leaves feeling confused, upset or embarrassed. In doing so, steps should be taken to maintain the quality of the relationship with the researcher and to eliminate any mistaken attitudes or beliefs participants may have about the research.

Participants' rights

Confidentiality is the ethical principle whereby a professional does not disclose to others information given in confidence to them by a client or patient. In research studies, personal information should only be collected if it is relevant to the study and can only be reported in such a way that participants' identities are not revealed. In research using case studies, pseudonyms are often used to preserve the anonymity of those involved, e.g. 'Little Albert' or 'Genie'. After debriefing, if the participants are unhappy about the protection of their privacy, they can demand that their data is destroyed.

Participants also have the right to voluntary participation in an experiment; in other words, they have the right to choose to become a part of an experiment if they want to. This choice is often based on being provided with some information as to the purposes, nature and procedures involved in the research design. Participants willingly agree to be involved in the study and are not forced or coerced in any way to participate.

Further to this, withdrawal rights enable participants to remove themselves from the

research situation at any point they decide (such as when the experiment is seen by the participants as causing too much personal discomfort or distress) and not feel guilty or pressured to continue, regardless of any possible effects on the results.

Despite knowing that they can leave at any point, some participants stay in an experiment even after becoming distressed by the conditions within it. If unexpected severe reactions occur, it is the responsibility of the researcher to immediately terminate the experiment and tend to the needs of the participants, referring them to appropriate services if necessary.

Professional conduct

At all times, the researcher is to act with integrity, demonstrating a commitment to act responsibly and follow recognised principles for the honest and ethical conduct of research, ensuring that the participants' welfare is preserved at all times.

The Code of Ethics (revised in September 2007) is written by the Australian Psychological Society. Within it, Section A outlines major ethical considerations, while Section B.14 outlines the procedures a psychologist must follow when conducting research. A copy of this code may be accessed and downloaded from the following website address:



www.psychology.org.au/about/ethics/

Further to this, psychologists must ensure that procedures followed are in accordance with the National Health and Medical Research Council guidelines within the *National Statement on Ethical Conduct in Research Involving Humans* (NHMRC, revised 2007). A copy of this document may be accessed and downloaded from the following website address:
www.nhmrc.gov.au/publications/synopses/_files/e72.pdf

Use of non-human animals in research

Animal studies have contributed to our understanding of many topics in psychology, such as learning theory, neuropsychology, perception, memory formation, parental deprivation and aggression. Such studies have also yielded many practical applications, including behavioural treatments and therapies, along with techniques for training animals for a variety of helpful roles, such as guide dogs, home helps, or drug-detection.

Advantages

Psychologists conduct research with animals for several reasons. In many cases, animal studies are performed when it would be unethical to do such research with humans, for example certain forms of brain research or drug testing. This justification is based on the premise that scientists have a primary moral obligation to improve the human condition through their research with other animals.

As animals do not try to understand the purpose of the experiment, their use allows psychologists to conduct experiments that are more precisely controlled through manipulation of independent variables and elimination of extraneous variables. They are also seen as more practical as they are easily accessible and their faster breeding cycles allow generational studies to be conducted on the influence of genetics and environmental factors on behaviour.

Psychologists are interested in the study of behaviour, including that of other animal species. Many psychologists, especially the behaviourists, believe that the differences between animals and humans are only quantitative along the evolutionary continuum, thereby allowing generalisations to be made from animal research to humans by 'scaling up' the results.

Limitations

Arguments against animal testing in psychology focus on the fact that a number of objective and behavioural measures indicate

that animals can be said to suffer stress, pain and anxiety and that inflicting suffering upon another creature is morally objectionable.

In many cases, the suffering of animals (the means) is often unnecessary and has not been justified by the knowledge gained from the studies (the ends).

Also, humans are qualitatively different to other animals. Superficial similarities in behaviour between animals and humans may lead to faulty over-generalisations, while the projection of human-like traits onto animals (anthropomorphism) may also lead to an exaggeration of similarity.

Further to this, laboratory studies on animals are often even more likely to lack ecological validity than those conducted on humans, and so these invalid findings are even less useful for generalisation to human behaviour.

Ethical guidelines regarding the use of animals in scientific research

To try to resolve such issues, ethical guidelines have been formulated regarding the ethical and humane care and use of animals used for scientific purposes and to prevent the unnecessary use of animal research in psychology. It appears that less psychological research on animals is being conducted today, with animal studies accounting for only a very small percentage of psychological research.

Such codes emphasise that the researchers should ensure that the use of animals is justified, taking into consideration the principle of beneficence by weighing the scientific or educational benefits with the potential effects on the welfare of the animals. Scientific activities using animals should only be performed when they are essential for the acquisition of significant information

relevant to the understanding of humans and/or animals and for the maintenance and improvement of their health and welfare.

Researchers who use animals for scientific purposes have a personal responsibility to ensure that the welfare of animals is always considered and that their care must be directly supervised by a person competent to ensure their comfort, health and humane treatment. Any signs of pain or distress not predicted in the design must be alleviated promptly and such action must take precedence over completing a project. If this is not possible, the animal must be euthanised without delay. If surgery is to occur, the animals must be given the appropriate anaesthesia so they do not experience pain.

Investigators should explore methods to minimise the number of animals used in their research, including the development and use of alternative techniques that would partially or totally replace the use of animals in scientific activities, such as computer simulations. However, the principle of reducing the number of animals used should not be implemented at the expense of greater suffering of individual animals.

Psychologists who have to use animals in their research must ensure that procedures followed are in accordance with the National Health and Medical Research Council guidelines within the Australian code of practice for the care and use of animals for scientific purposes (NHMRC, revised 2004). A copy of this document may be accessed and downloaded from the following website address:



www.nhmrc.gov.au/publications/synopses/_files/ea16.pdf

Glossary of terms

Beneficence

The ethical principle whereby a researcher is responsible for maximising potential benefits of the research and minimising the potential risks of harm or discomfort for all research participants.

Code of Ethics

A set of guidelines outlining standards for professional practice and conduct that must be followed by all psychologists and researchers when working with people and animals.

Conclusion

A decision made by the researcher about whether the hypothesis was supported based on the results obtained in an experiment.

Confidentiality

The ethical principle whereby, in research studies, personal information should only be collected if it is relevant to the study and can only be reported in such a way that participants' identities are not revealed.

Confounding variable

An unwanted factor occurring in an experiment that intervenes with the cause-effect relationship between the independent variable and the dependent variable.

Control group

A group within an experiment that has not received the independent variable which is used as a standard of comparison against the experimental group that has received the independent variable, enabling the researcher to determine whether the independent variable has affected the dependent variable.

Controlled variables

A type of extraneous variable whose influence has been removed from the research via sampling, experimental method and/or statistical control.

Convenience sampling

The process of selecting members of a population who are easily obtainable to participate in research.

Cross-sectional study

Research in which individuals of differing ages drawn from a representative sample are compared in a single study.

Data

The information collected by researchers.

Debriefing

The process whereby the researcher provides experimental participants with as much information or feedback about the study as possible to clarify the purpose of the research, remove any misconceptions caused by deception within the experimental design, and provide results and interpretations to the participants.

Deception

The deliberate misleading of research participants by the experimenter when it is felt that the results would be affected by participants changing their behaviour because of

their knowledge of the actual purpose of the study.

Dependent Variable (DV)

An element of a participant's behaviour that can be observed or measured as being changed in some way as a result of the independent variable.

Descriptive statistics

A summary, organisation or description of data (e.g. the mean, or average) in order for it to be easily interpreted or communicated. They therefore provide information to the researcher about the sample in their research which may affect their choice of inferential statistics.

Direct observation

A research method involving investigating overt or directly measurable behaviour through the process of watching and recording it as it occurs.

Double-blind procedure

A test in which neither the experimenters nor participants are aware of which participants have been allocated to the experimental group.

Empirical evidence

Scientific research gathered using the direct method of systematic observation.

Experiment

A method of data collection used to systematically measure the relationship between variables which have been operationalised in a hypothesis.

Experimental condition

The condition in an experiment which contains the presence of the independent variable.

Experimental group

The participants in an experiment who are allocated the independent variable in order to observe its effects on their behaviour or experience.

Experimenter bias

An unconscious expectation of the experimenter which may influence their observations of data.

Experimenter effect

Occurs when the unconscious expectations, personal characteristics or treatment of the data by the experimenter may adversely affect the dependent variable which may bias the experimental results.

Extraneous variables

Conditions a researcher wants to avoid influencing the outcome of the experiment.

Generalisation

The applications of the conclusions based on the results obtained to other settings outside the study.

Hypothesis

A testable prediction that an independent variable(s) or treatment(s) will cause an effect on the dependent variable(s).

Independent-groups design

A research design in which participants are randomly allocated to groups. This makes it equally likely for an individual to be in the experimental or control group.

Independent Variable (IV)

The treatment variable in an experiment that has been deliberately varied or systematically manipulated by the experimenter in order to measure whether it produced a change in the dependent variable.

Inferential statistics

Formal data analysis which measures the likelihood of results obtained for a study occurring by chance.

Informed consent

The ethical process whereby an experiment participant is given all the necessary details, including any potential risks that may be present in the research design, in order to reach a decision to willingly agree (usually in writing) to being a part of an experiment.

Integrity

The ethical process whereby a researcher is committed to following recognised principles for the honest and ethical conduct of research in their search for knowledge.

Justice

The ethical principle which promotes a fair distribution of benefits and inconvenience within the population of interest, as well as for any individual research participant.

Longitudinal study

Research in which a sample of individuals is studied over a long time period.

Matched-participants design

A method of controlling subject characteristics involving the placement of equivalent pairs of participants into each group. Participants are paired on variables which, if not controlled, may have a confounding effect on the research.

Mean

The statistical average for a set of measurements/scores.

Median

When all scores in a set of measurements are arranged in order, the median is the middle score within the set.

Mode

In a set of scores/measurements, the mode is the score that occurs most frequently. There may be more than one mode in any given set of scores.

Objective data

Data that has been gathered using systematic observation which is not influenced by any personal bias.

Observation

A scientific research method which involves watching and recording behaviour as it occurs in a clinical or naturalistic setting.

Observer bias

The interference of an observer's personal expectations, motives and prior experience which detracts from the accuracy of their research.

Operational definition

The precise, comprehensive description of the concept to be measured in an experiment, and the procedures that will be utilised to measure that concept.

Operational hypothesis

The expression of a hypothesis in terms of how the researcher will determine the presence and levels of the variables under investigation; that is, how the experimenter is going to put their hypothesis into operation.

p value

The probability level which forms the basis for deciding if results are statistically significant (not due to chance).

Participants

The individuals used in any type of research study such as an experiment or correlational study.

Participant allocation

The systematic process of assigning participants to different groups to ensure that personal attributes of participants which may influence the results are evenly distributed within the experimental and control groups.

Participant selection

The systematic sampling process of choosing participants for research as a representative subset or portion of the population of interest.

Placebo

A fake treatment used as a control condition in experiments to counter the effect of participants knowing they have taken something.

Placebo effect

Occurs when a behaviour is caused by an individual's expectation rather than by a specific procedure which has been administered to elicit that behaviour.

Population

The entire group of individuals related to the problem of interest that the researcher is testing.

Professional conduct

The ethical principle whereby the researcher is to act responsibly and ethically in order to ensure that the participants' welfare is preserved at all times.

Qualitative measures

Factual or descriptive pieces of information about the qualities of the characteristics or behaviours being measured.

Quantitative measures

Numerical measures/values used to quantify/describe the characteristics or behaviours being measured.

Random allocation

The allocation of participants to different groups in an experiment ensuring that each participant has an equal chance of being within any of the groups.

Random sampling

A form of allocating participants from the population of interest to form part of the sample such that each member of the population has an equal chance to be selected.

Range

The difference between the highest and lowest scores in a frequency distribution.

Repeated-measures design

One group undertakes both the experimental condition and the control condition.

Research ethics

A set of moral principles and practices that have been formalised by psychologists to provide guidelines for researchers to follow when considering using humans or animals as research subjects.

Respect for persons

The ethical principle that promotes that the researcher should have a proper regard for the welfare, rights, beliefs, perceptions, customs and cultural heritage of all individuals involved in their research.

Sample

A sub-set of the population that is used for research purposes.

Sampling

The method used to select participants for a study. Types of sampling include random sampling and stratified sampling.

Scientific method

A series of orderly steps relying on clearly defined goals, objectivity and experimentation to obtain empirical evidence.

Single-blind procedure

An experiment in which participants are unaware of the experimental or control condition to which they have been assigned.

Standard deviation

A measure of the variability of scores in a distribution indicating the average difference between the scores and their mean.

Statistical significance

The term used to indicate whether the results obtained in an experiment do not occur by chance and may therefore be attributed to other variables. In scientific research, an alpha level of 0.05 significance is commonly used as a benchmark to gauge whether a difference obtained in the findings is truly due to the influence of the independent variable and not attributed to chance.

Stratified sampling

A method of participant selection used to attempt to prevent bias by making the sample more representative of the population. It involves identifying some of the factors (strata) present in the population such as age, sex or income level and then selecting a separate sample from each stratum in the same proportions.

Subject

A participant in an experiment.

Subjective data

Data obtained by self-report measures in which subjects give verbal or written responses to a series of research questions.

Uncontrolled variables

Those variables that have influenced the result as their presence was not accounted for (and removed) in the experimental method. Uncontrolled variables which cause a change in the value of the dependent variable are termed 'confounding variables'.

Variable

A factor pertaining to the property of an individual or object that can alter in amount or kind and can be measured.

Voluntary participation

The ethical principle whereby participants willingly choose whether or not they become a part of an experiment.

Withdrawal rights

The ethical principle promoting the right of experimental participants to remove themselves from the research situation at any point they decide.

Revision checklist – Research methods

The following checklist of Learning Outcome 3 will enable you to tick off the key concepts and skills you have revised to ensure that you have thoroughly reviewed the content which was integrated throughout the Unit 3 course.

Please note that the key knowledge and skills will not be assessed separately (VCE Study

Design, 2009) and have therefore been integrated to aid your revision process.

To achieve this outcome, you will need to be able to demonstrate knowledge and related skills pertaining to the concepts outlined below.

Tick ✓ the box once you are confident that you have covered and understand each concept.

Formation of operational hypotheses
Hypothesis
Independent variable
Dependent variable
Operational terms
Development of an operational hypothesis
Participant selection
Random sampling
The strengths and limitations of random sampling
Stratified sampling
The strengths and limitations of stratified sampling
Participant allocation
Control groups
Experimental groups
Extraneous variables
The difference between extraneous variables and confounding variables
Placebo effects
Experimenter effects
Single-blind procedure
Double-blind procedure
Research designs used to minimise the effects of extraneous variables in experiments
Independent-groups design
Matched-participants design
Repeated-measures design
Critical evaluation of experimental designs
Descriptive statistics

Inferential statistics
The meaning of statistical significance
Analysis and interpretation of p values
($p < 0.01$ and $p < 0.05$)
Application of appropriate statistical measures
Findings
Conclusions
Generalisations
Appropriateness of conclusions and generalisations based on the results obtained by psychological research
Ethical principles in the conduct of psychological research
The role of the experimenter
The use, protection and security of:
• Participants' rights
• Confidentiality
• Voluntary participation
• Withdrawal rights
• Informed consent procedures
• Deception in research
• Debriefing
Professional conduct
The use of non-human animals in research
Advantages
Limitations
Ability to generalise results to humans



Practice exam questions: Research methods

Instructions

- Each multiple-choice question is worth 1 mark.
- Short-answer questions are worth 1 mark unless otherwise indicated.

Scientific method

Solutions start on page 122.

Multiple-choice question

QUESTION 10

A researcher is trying to establish a causal relationship between levels of arousal and performance. Which research method should they use?

- A a survey
- B a clinical study
- C an experiment
- D a correlational study

Short-answer question

QUESTION 20

What are the advantages of using formal experiments in psychological research?

Operational hypotheses

Solutions start on page 122.

Multiple-choice questions

QUESTION 300

An experiment is performed to explore the effectiveness of recall versus recognition on performance in a memory test. In this case, the test performance is

- A the independent variable.
- B an extraneous variable.
- C the dependent variable.
- D a confounding variable.

QUESTION 400

In order to explore whether background music improves the retention of new material, an experiment was performed whereby two groups had to study the same material, one while listening to music and the other without listening to music. The independent variable in this case would be

- A the type of mnemonics employed while learning the material.
- B the size of each group.
- C the material studied by the participants.
- D music.

Short-answer question

QUESTION 500

What is the difference between a research hypothesis and an operational hypothesis?

2 marks

Participant selection and allocation

Solutions start on page 122.

Multiple-choice questions

QUESTION 60

A researcher samples from the population such that gender and age groups are represented in proportion to their numbers within the population. This study uses a

- A random sample.
- B repeated measures design.
- C stratified sample.
- D matched-subjects design.

QUESTION 700

Random sampling is used to ensure that

- A all extraneous variables are controlled within the experimental design.
- B the participants are less likely to behave according to the experimenter's expectations.
- C the subjects chosen form a representative subset of the population.
- D the volunteers form a sample that is proportional in regard to all relevant demographic characteristics.

Short-answer questions

The following information pertains to Questions 8 and 9.

In order to perform an ERA to explore the effectiveness of mnemonics in aiding retrieval, members of a psychology class asked, at random, students in the canteen queue whether they would consent to being part of the experiment. Half of the students were asked to memorise a list of words in order to reproduce it on a blank sheet of paper, while the other half were shown the same list but were instructed to make up a story in order to remember the list before writing it down.

QUESTION 80

Why did the experimenters choose to select the subjects in this manner?

QUESTION 900

What is the term that describes the first group (that were given no instructions)? Briefly explain its purpose within the experimental design.

2 marks

Extraneous variables

Solutions start on page 123.

Multiple-choice questions

QUESTION 1000

Researchers decide to subject the participants to an experimental condition whereby they only consume decaffeinated beverages but are under the impression that they are having a 'normal' amount of caffeine. The researchers are

- A attempting to eliminate experimenter bias.
- B employing a double-blind procedure.
- C trying to control for the placebo effect.
- D introducing too many variables for analysis.

QUESTION 1100

A researcher asks people in the street to take part in an experiment, then randomly gets them to enter one of two doors. Each group is then required to do different tasks – one under the supervision of a coach, the other having to work together to follow the instructions on a sheet of paper. The researcher then compares the effectiveness of each group in achieving the objectives of the task as set. The researcher in this case has employed a(n) _____ design.

- A matched participants
- B repeated measures
- C independent groups
- D double-blind

The following information pertains to Questions 12 and 13.

Researchers wanted to investigate whether herbal treatments could improve intelligence and memory. After advertising for volunteers, a random sample was drawn from this group such that those chosen had the same proportions of age and gender as the general population. Participants were then given an IQ test and ranked according to the results. Based on the data collected, participants were paired so that the sample could be split into two equal groups with an equal spread of IQ scores while keeping the same proportions of age and gender as the population. Researchers then gave the herbal remedy to the first group to use over a two-week period, while the second group was supplied with ordinary black tea. Participants monitored their memory for two weeks via a diary, and were then given a second, different IQ test. The researchers then analysed the data by comparing the test results.

QUESTION 1200

The researchers in this case used

- A a dependent-groups design.
- B a repeated-measures design.
- C a matched-participants design.
- D an independent-groups design.

QUESTION 1300

The study described in the scenario employed a _____ procedure, with the second group being exposed to the _____ condition.

- A single-blind; placebo
- B double-blind; experimental
- C single-blind; experimental
- D double-blind; placebo

Short-answer question

QUESTION 140

Within a research study, when is an experimenter effect said to have occurred?

Statistics

Solutions start on page 123.

Multiple-choice questions

QUESTION 150

Frequency distributions, measures of central tendency and measures of variability are all examples of

- A descriptive statistics.
- B mathematical imperatives in psychological research.
- C nominal scales of measurement.
- D inferential statistics.

QUESTION 1600

If results in an experiment are statistically significant, they

- A summarise the data to show clear tendencies within them.
- B demonstrate the likelihood that the dependent variable definitely causes a change in the independent variable.
- C are probably not due to chance.
- D appropriately operationalise the independent variable.

Short-answer question

QUESTION 1700

What is the function of inferential statistics?

Research findings

Solutions start on page 123.

Short-answer questions

QUESTION 1800

Distinguish between conclusions and generalisations within research reports.

Ethical principles

Solutions start on page 123.

Multiple-choice questions

QUESTION 190

Which of the following is **not** one of the primary ethical considerations in research with humans?

- A the provision of details regarding the experiment to the research participants
- B the use of deception within the research design
- C the participants' right to continue even if they are exhibiting signs of discomfort or distress
- D the participants' rights to privacy

QUESTION 2000

A series of studies into anterograde amnesia refer to the case of 'H.M.', a patient who exhibited this condition after surgery for severe epilepsy. These studies examined his condition over several years and describe in great detail the characteristics of this disorder. Which ethical consideration is most evident in his case?

- A debriefing
- B confidentiality
- C informed consent
- D beneficence

QUESTION 2100

Which of the following is an advantage of using animals instead of humans in research?

- A There is more precise control than with human research participants.
- B It generates data that can be compared to different species.
- C Research that cannot be done ethically with humans can be performed.
- D All of the above.

Short-answer question

QUESTION 2200

Why are ethical issues considered important when psychologists perform research with human participants?

2 marks

Miscellaneous questions

Solutions start on page 123.

Short-answer questions

The following information pertains to

Questions 23 through to 30.

At the beginning of a double lesson, a class of Year 12 psychology students were told by their teacher that they all had to perform some memory tests as part of a research task to meet the requirements for a learning outcome.

They were all given a blank sheet of paper and instructed that their teacher was going to read out a list of 15 words that they would be required to memorise. The teacher also advised the students that they should not worry about what score they got as no names would be attached to any of the results. Immediately after the teacher had finished reading the list, students were allowed to write down as many of the words as they could remember. They were then told to put their lists aside and the teacher went on with other activities.

Halfway through the second lesson, the students were given another sheet of paper and told that they were going to hear a second list of 15 words, which they would also have to memorise. This time, however, following the presentation of the list, they would be required to count backwards by threes from 245 for thirty seconds before they could write down as many of the words as they could remember.

The teacher then went through both lists, recording the number of students that had written each word. This collated data was then used as the basis for a written research report.

QUESTION 2300

Based on your knowledge of memory, write an operational hypothesis for this ERA.

QUESTION 2400

Identify the independent and dependent variables involved in this study.

2 marks

QUESTION 2500

Name the research design that was employed in this study.

QUESTION 2600

Outline one of the advantages associated with this experimental method.

QUESTION 2700

Outline one of the disadvantages associated with this experimental method.

QUESTION 2800

The next day, the teacher informed the class that their results were statistically significant. What would be considered to be an appropriate p value to make such a statement?

QUESTION 2900

What does it actually mean to say that the results were statistically significant?

QUESTION 3000

From your knowledge of ethical considerations regarding psychological demonstrations involving students, comment on how the teacher applied the following principles:

- i voluntary participation
- ii confidentiality